

IN THE CLAIMS

1. (Previously Presented) A retractable lens having an optical element retracting mechanism, said retractable lens including a photographing optical system having a plurality of optical elements, said retractable lens comprising:

a linearly movable ring configured to be guided along an optical axis of said photographing optical system without rotating, said linearly movable ring retracting toward a picture plane along said optical axis when said retractable lens moves from an operational state to a fully-retracted state;

a retractable holder configured to support a retractable optical element as one of the plurality of optical elements, said retractable holder positioned inside and supported by said linearly movable ring, such that said retractable holder is movable in a plane substantially orthogonal to said optical axis;

a holding device configured to hold said retractable holder such that said retractable optical element remains on said optical axis when said retractable lens is in said operational state;

a retracting device configured to move said retractable holder such that said retractable optical element retracts to a radially retracted position which deviates from said photographing optical axis when said linearly movable ring, together with said retractable holder, retracts toward said picture plane; and

a flexible PWB configured to connect an electronic component supported inside said linearly movable ring, with an electronic circuit positioned outside said linearly movable ring;

wherein said retractable holder is separate from said flexible PWB when said retractable holder is held by said holding device in an operational position in which said retractable optical element is on said optical axis; and

wherein said retractable holder presses said flexible PWB in a radial direction of said linearly movable ring from an inside to an outside of said linearly movable ring and supports said flexible PWB when said retractable holder is moved to a radially retracted position by said retracting device such that said retractable optical element retracts to said position that deviates from said photographing optical axis.

2. (Previously Presented) The retractable lens according to claim 1, wherein said retractable holder comprises:

a cylindrical lens holder portion configured to hold said retractable optical element;

a swing arm portion projecting from said cylindrical lens holder in a radial direction of said cylindrical lens holder portion; and

a pivoted cylindrical portion fixed to an end of said swing arm portion, and fitted on a pivot to be rotatable on said pivot, said pivot positioned inside said linearly movable ring,

wherein said swing arm portion presses said flexible PWB when said retractable holder is rotated to said radially retracted position by said retracting device.

3. (Original) The retractable lens according to claim 2, wherein said pivot extends generally parallel to said optical axis.

4. (Previously Presented) The retractable lens according to claim 1, wherein said flexible PWB comprises:

a straight portion which extends parallel to said optical axis from said electronic component along an inner peripheral surface of said linearly movable ring; and

a loop-shaped turning portion which bends radially outwards proximate a rear end of said linearly movable ring,

wherein said retractable holder comes into contact with said loop-shaped turning portion when said rotatable holder is rotated to said radially retracted position by said retracting device.

5. (Previously Presented) The retractable lens according to claim 4, wherein said linearly movable ring comprises a linear guide groove which extends substantially parallel to said optical axis and penetrates said linearly movable ring in a radial direction thereof;

wherein said retractable lens further comprises a linear guide configured to guide said linearly movable ring linearly along said optical axis without rotating said linearly movable ring, said linear guide having a linear guide key configured to engage said linear guide groove to be guided therealong such that said linearly movable ring is guided linearly along said optical axis by engagement of said linear guide key with said linear guide groove;

wherein said flexible PWB further comprises:

a second straight portion extending forward from said loop-shaped turning portion along an inner surface of said linear guide key; and

a third straight portion extending rearward along an outer surface of said linear guide key from a front end of said second straight portion which is bent radially outwards proximate a front end of said linear guide key; and

wherein said third straight portion is partially fixed to said linear guide key such that a size of said loop-shaped turning portion is variable in accordance with relative movement between said linearly movable ring and said linear guide in said optical axis direction.

6. (Original) The retractable lens according to claim 1, wherein said retractable holder comprises:

a cylindrical lens holder portion configured to hold said retractable optical element;

a swing arm portion projecting from said cylindrical lens holder in a radial direction of said cylindrical lens holder portion; and

a pivoted cylindrical portion fixed to an end of said swing arm portion, and fitted on a pivot to be rotatable on said pivot, said pivot positioned inside said linearly movable ring,

wherein said flexible PWB comprises:

a straight portion which extends parallel to said optical axis from said electronic component along an inner peripheral surface of said linearly movable ring; and

a loop-shaped turning portion which bends radially outwards proximate a rear end of said linearly movable ring,

wherein said swing arm portion comprises a projection that projects rearward and comes into contact with said loop-shaped turning portion to support said loop-shaped turning portion when said rotatable holder is rotated to said radially retracted position by said retracting device.

7. (Original) The retractable lens according to claim 1, wherein said electronic

component comprises a shutter unit.

8. (Currently Amended) The retractable lens according to claim 1, wherein said plurality of optical elements comprises at least one rear optical element positioned behind said retractable optical element when said retractable ~~photographing~~ lens is in said ~~ready-to-photograph~~ operational state; and

wherein said retractable optical element is positioned in an off-axis space radially outside an on-axis space in which said rear optical element is positioned, so that said retractable optical element and said rear optical element are in substantially a same positional range in the optical axis direction, when said retractable ~~photographing~~ lens is in said fully-retracted state.

9. (Original) The retractable lens according to claim 1, wherein said retractable optical element comprises a lens group.

10. (Original) The retractable lens according to claim 1, wherein said optical system comprises a zoom photographing optical system; and

wherein said retractable optical element comprises a lens group as a part of said zoom photographing optical system.

11. (Original) The retractable lens according to claim 1, herein said holding device comprises a spring configured to bias said retractable holder to move in a direction to position said retractable optical element on said optical axis.

12. (Currently Amended) The retractable lens according to claim 1, wherein said ~~photographing~~ lens is incorporated in a digital camera, said retractable ~~photographing~~ lens being retracted into a camera body when in said fully retracted state.

13. (Original) The retractable lens according to claim 12, wherein said

electronic circuit comprises a CPU configured to control operation of said digital camera.

14. (New) A digital camera comprising a body, an image pickup device and a retractable lens, said retractable lens comprising an optical element retracting mechanism and a photographing optical system comprising a plurality of optical elements, the camera further comprising an image display panel affixed to the body for displaying an image picked up by the image pickup device, said image pickup device and retractable lens housed within the body, said retractable lens comprising:

a linearly movable ring configured to be guided along an optical axis of said photographing optical system, said linearly movable ring retracting toward a picture plane along said optical axis when said retractable lens moves from an operational state to a fully-retracted state;

a retractable holder configured to support a retractable optical element as one of the plurality of optical elements, said retractable holder positioned inside and supported by said linearly movable ring, such that said retractable holder is movable in a plane generally orthogonal to said optical axis;

a holding device configured to hold said retractable holder such that said retractable optical element remains on said optical axis when said retractable lens is in said operational state;

a retracting device configured to move said retractable holder such that said retractable optical element retracts to a radially retracted position which deviates from said photographing optical axis when said linearly movable ring, together with said retractable holder, retracts toward said picture plane; and

a flexible PWB configured to connect an electronic component supported inside

said linearly movable ring, with an electronic circuit positioned generally outside said linearly movable ring;

wherein said retractable holder is separate from said flexible PWB when said retractable holder is held by said holding device in an operational position in which said retractable optical element is on said optical axis; and

wherein said retractable holder presses said flexible PWB in a radial direction of said linearly movable ring from an inside to an outside of said linearly movable ring and supports said flexible PWB when said retractable holder is moved to a radially retracted position by said retracting device such that said retractable optical element retracts to said position that deviates from said photographing optical axis.

15. (New) The camera according to claim 14, wherein said retractable holder comprises:

a cylindrical lens holder portion configured to hold said retractable optical element;

a swing arm portion projecting from said cylindrical lens holder in a radial direction of said cylindrical lens holder portion; and

a pivoted cylindrical portion fixed to an end of said swing arm portion, and fitted on a pivot to be rotatable on said pivot, said pivot positioned inside said linearly movable ring,

wherein said swing arm portion presses said flexible PWB when said retractable holder is rotated to said radially retracted position by said retracting device.

16. (New) The camera according to claim 15, wherein said pivot extends generally parallel to said optical axis.

17. (New) The camera according to claim 14, wherein said flexible PWB comprises:

a straight portion which extends parallel to said optical axis from said electronic component along an inner peripheral surface of said linearly movable ring; and

a loop-shaped turning portion which bends radially outwards proximate a rear end of said linearly movable ring,

wherein said retractable holder comes into contact with said loop-shaped turning portion when said rotatable holder is rotated to said radially retracted position by said retracting device.

18. (New) The camera according to claim 17, wherein said linearly movable ring comprises a linear guide groove which extends generally parallel to said optical axis and penetrates said linearly movable ring in a radial direction thereof, the camera further comprising a linear guide configured to guide said linearly movable ring linearly along said optical axis without rotating said linearly movable ring, said linear guide having a linear guide key configured to engage said linear guide groove to be guided therealong such that said linearly movable ring is guided linearly along said optical axis by engagement of said linear guide key with said linear guide groove;

wherein said flexible PWB further comprises:

a second straight portion extending forward from said loop-shaped turning portion along an inner surface of said linear guide key; and

a third straight portion extending rearward along an outer surface of said linear guide key from a front end of said second straight portion which is bent radially outwards proximate a front end of said linear guide key; and



wherein said third straight portion is partially fixed to said linear guide key such that a size of said loop-shaped turning portion is variable in accordance with relative movement between said linearly movable ring and said linear guide in said optical axis direction.

19. (New) The camera according to claim 14, wherein said retractable holder comprises:

a cylindrical lens holder portion configured to hold said retractable optical element;

a swing arm portion projecting from said cylindrical lens holder in a radial direction of said cylindrical lens holder portion; and

a pivoted cylindrical portion fixed to an end of said swing arm portion, and fitted on a pivot to be rotatable on said pivot, said pivot positioned inside said linearly movable ring,

wherein said flexible PWB comprises:

a straight portion which extends parallel to said optical axis from said electronic component along an inner peripheral surface of said linearly movable ring; and

a loop-shaped turning portion which bends radially outwards proximate a rear end of said linearly movable ring,

wherein said swing arm portion comprises a projection that projects rearward and comes into contact with said loop-shaped turning portion to support said loop-shaped turning portion when said rotatable holder is rotated to said radially retracted position by said retracting device.

20. (New) The camera according to claim 14, wherein said electronic

component comprises a shutter unit.

21. (New) The camera according to claim 14, wherein said plurality of optical elements comprises at least one rear optical element positioned behind said retractable optical element when said retractable lens is in said operational state; and

wherein said retractable optical element is positioned in an off-axis space radially outside an on-axis space in which said rear optical element is positioned, so that said retractable optical element and said rear optical element are in generally a same positional range in the optical axis direction, when said retractable lens is in said fully-retracted state.

22. (New) The camera according to claim 14, wherein said retractable optical element comprises a lens group.

23. (New) The camera according to claim 14, wherein:

said optical system comprises a zoom photographing optical system; and

said retractable optical element comprises a lens group as a part of said zoom photographing optical system.

24. (New) The camera according to claim 14, herein said holding device comprises a spring configured to bias said retractable holder to move in a direction to position said retractable optical element on said optical axis.

25. (New) The camera according to claim 14, wherein said retractable lens is retracted into said body in said fully-retracted state.

26. (New) The camera according to claim 14, wherein said electronic circuit comprises a CPU configured to control operation of the camera.